

# **ANTERIOR CRUCIATE LIGAMENT INJURY AND SURGERY**

**ESSAY**

Submitted for partial fulfillment of  
M.Sc. degree in Orthopaedic Surgery

By

**Belal Ismail Abdel Razik**  
M.B.B.ch.

Under supervision of

**Prof. Dr. Elsayed Mohamed Wahb**

Prof. of orthopaedic surgery  
Ain Shams University  
Faculty of Medicine

**Dr. Alaa Hifny**

Assist. Prof. of orthopaedic surgery  
Ain Shams University  
Faculty of Medicine

Faculty of Medicine  
Ain Shams University

1996







## **ACKNOWLEDGMENTS**

First and foremost thanks are due to **ALLAH**  
The most beneficent and merciful

It is really difficult for me to find words that can express my gratitude to **Prof. Dr. ELSAYED WAHB** Professor of Orthopaedic Surgery, Faculty of Medicine, Ain Shams University, for his kind help and sincere advice.

I am grateful to **Dr. ALAA HIFNY**, Assistant Professor of Orthopaedic Surgery, Faculty of Medicine, Ain Shams University, who supervised this work and offered all help to me throughout the whole work.

**THE CANDIDATE**



## TABLE OF CONTENTS

|                                                       | Page |
|-------------------------------------------------------|------|
| - INTRODUCTION -----                                  | 1    |
| - REVIEW OF LITERATURE -----                          | 3    |
| * Anatomy of anterior cruciate ligament<br>(ACL)----- | 3    |
| * Biomechanics -----                                  | 12   |
| * Diagnosis of ACL injury -----                       | 22   |
| * Surgical treatment of ACL -----                     | 51   |
| * Complications of ACL surgery -----                  | 103  |
| * Rehabilitation -----                                | 114  |
| - SUMMARY AND CONCLUSION -----                        | 124  |
| - REFERENCES -----                                    | 127  |
| - ARABIC SUMMARY                                      |      |



# ***INTRODUCTION***

---

The M.R.I. is still a relatively new diagnostic tool in orthopedics and it can demonstrate rupture of the A.C.L.

Arthroscopic examination has a high degree of clinical accuracy that encourages using it to assist the diagnosis of A.C.L. injury.

The treatment of torn Anterior cruciate ligament is one of the the most controversial topics in orthopedic surgery.

The research continues for the ideal surgical procedure whether with intra-articular or extra-articular procedures or with a combination of intra-articular and extra-articular procedures.

Modern approaches to the problem involve replacing the A.C.L. with Variety of materials, autologous patellar tendon, A.C.L. allograft.

There are various synthetic materials as carbon fiber and polyester used to replace ruptured A.C.L. by using a variety of different techniques.

Now arthroscopic technique and equipments have improved with which treatment of torn A.C.L. is provided with lower morbidity and earlier motion and easier rehabilitation.

***REVIEW  
OF  
LITERATURE***



# ***ANATOMY***



## **ANATOMY OF THE ANTERIOR CRUCIATE LIGAMENT**

The cruciate ligaments are bands of regularly oriented, dense connective tissue that connect the femur and tibia. They are intra-articular extrasynovial structures (Freiberger, 1993).

The anterior cruciate ligament is surrounded by a mesentry-like fold of synovium that originates from the posterior intercondylar area of the knee and completely envelops both the anterior and posterior cruciate ligament (Arnoczky, 1983).

The anterior cruciate ligament (A.C.L.) originates from an elliptical area approximately 15 - 20 mm long on the most posterior & superior part of the medial surface of the lateral femoral condyle. It passes forward, downward and medially to the anterior intercondylar area of the tibia (Figure 1a), where it inserts between the anterior attachments of the menisci (Strobel and Stedtfeld, 1990)

The average length of the A.C.L. is 31 - 38 mm and the average width is 11 mm (Freddie et al., 1994).

The A C L wrinkles into the appearance of three bundles as the Knee flexes. These bundles are an anteromedial and posterolateral and intermediate. They are often demonstrated as separate structures, twisted together during flexion (Amis and Dawkins, 1991).

The A C L has a simple, predictable fiber arrangement with consistently matched origins and insertions of individual fibers within the attachments as a whole. The fibers that originate superiorly on the femur inserts anteriorly on the tibia, and those that originate inferiorly insert posteriorly. Central fibers keep their relative orientation throughout the ligament (O'Brien, 1992). The fibers of the ligament are not parallel in extension, but show external torsion of  $46^{\circ}$  (Figure 1b). When the Knee flexes to  $90^{\circ}$ , the torsion angle increases to  $105^{\circ}$ , as manifested by an increased overall twisting of the ligament (Strobel and Stedtfeld, 1990).

In any position of the knee , a portion of the A C L remains under tension and function (Aronczyk, 1983).